



Indocypha cyanicauda sp. nov. from southern Yunnan, China (Odonata: Chlorocyphidae)

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Indocypha cyanicauda Zhang & Hämäläinen, spec. nov. (holotype ♂ from Xishuangbanna, Yunnan, China; deposited at the Kunming Natural History Museum of Zoology) is described and illustrated from both sexes and compared with its congener *I. vittata*. Brief notes on the ecology and behaviour of the new species are provided.

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Introduction

The members of the Oriental chlorocyphid genus *Indocypha* Fraser, 1949 are characterized by hyaline wings and a tapering, dorsoventrally flattened and colourful abdomen in the males. They are rare and often elusive inhabitants of rivers and broad and fast flowing streams in forested areas. With the exception of the more widespread *Indocypha vittata* (Selys, 1891), the known ranges of the species of this genus are confined to southern China and to the adjacent areas in northern Vietnam and Laos. Information on these species and their distribution is provided by Zhang, Hämäläinen, and Tong (2010) and Hämäläinen (2014).

In early October 2012 the first author, Hao-miao Zhang, collected two female specimens of an *Indocypha* species in the “Xishuangbanna Tropical Botanical Garden” in Mengla County, Xishuangbanna Dai Autonomous Prefecture, in the southernmost tip of Yunnan Province. Previously two other species of this genus, *I. vittata* and *I. silbergliedi* Asahina, 1988, had been recorded from the same area. The specimens collected were not *vittata*, and were considered too large to be *silbergliedi*, the female of which is still unknown. Then in November 2017 the first author managed to collect a good series of both sexes of this species in a river a few kilometres from the place where the two females were found earlier. In the male (Figures 1, 2) the uppersides of abdominal segments 7 and 8 and the anterior half of S9 are whitish blue to pale cerulean. These striking damselflies represent a distinct new species, described here as *Indocypha cyanicauda* sp. nov. It is the seventh known species in the genus.

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Figures 1, 2. Male individuals of *Indocypha cyanicauda* sp. nov., photographed at Luosuojiang River (Yunnan, Xishuangbanna) by Hao-miao Zhang in November 2017.

Taxonomy

Indocypha cyanicauda Zhang & Hämäläinen, sp. nov.

Indocypha neglecta [nec. Hämäläinen, 2014]; Hämäläinen (2014: 81, 84–85; a teneral male specimen from “Tonkin”, which was not included in the type series of *I. neglecta*).

Indocypha sp.; Hämäläinen (2014: 89; a teneral female specimen with a confusing locality label).

Etymology

The species epithet *cyanicauda*, a noun in apposition, is a combination of the Greek word *cyan* (= “blue”) and the Latin word *cauda* (= “tail”), referring to the conspicuous pale cerulean colour on the dorsum of the abdominal segments 7–9 in the male.

Specimens examined

Holotype ♂: China, Yunnan Province, Xishuangbanna Dai Autonomous Prefecture, Mengla County, Mannadu Village, Luosuojiang River (21.92833°N, 101.31805°E; 550 m asl), 21 November 2017, Hao-miao Zhang leg. The holotype is deposited at Kunming Natural History Museum of Zoology, Kunming Institute of Zoology, Chinese Academy of Sciences, Yunnan Province, China.

Paratypes: 45♂, 13♀, same locality, date and collector as for holotype; 1♂, same locality and collector, 1 December 2017; 1♀ a stream (21.85888°N, 101.28833°E; 550 m asl) within the Xishuangbanna National Reserve, 22 November 2017; 2♀, Xishuangbanna Tropical Botanic Garden (21.93027°N, 101.25694°E; 550 m asl), same collector, 1 October 2012.

Other specimens: Two old specimens at the Muséum national d'Histoire naturelle, Paris (MNHN): 1♂ bearing a handwritten label by René Martin: “Libellago asiatica. Tonkin” and two printed labels: “Coll. R. Martin 1920” / “Muséum Paris”; 1♀ bearing a confusing handwritten label (see the Remarks below) and two printed labels as above.

Male holotype (Figure 3)

Head. Almost black, only a pair of tiny yellow spots beside lateral ocelli and a pair of triangular yellow spots on the side of occiput. In life eyes dark brown with obscure greyish blue in lower part and at border.

Thorax. Prothorax entirely black. Synthorax largely black with yellowish brown stripes similar to those shown in Figure 1. Middorsal carina narrowly yellow. Mesepisternum with a long and narrow humeral stripe and a separate small spot near antealar ridge. Mesepimeron with narrow, curved stripe extending over the posterior 2/3rd. Metepisternum with irregularly shaped stripe covering stigma; the stripe being broadest in the middle, then bifurcating to narrow upper branch and broader lower branch, the latter being shorter. Broad, short stripe covering the posterior 2/3rd of metepimeron. Ventral side of thorax black. Legs largely black, inner face of mesothoracic tibia coloured white in the middle, extending about 1/3rd of its length. Metathoracic tibiae with more extensive white on inner face, extending about 3/5th of its length.

Wings (Figure 3). Hyaline, with a faint brownish tint at base, restricted to subcostal and cubital fields. Forewings: 15 antenodals above Sc, 13 (left) and 14 (right) antenodals below Sc; 17 (left) and 18 (right) postnodals above R1. Hind wings: 14 (left) and 15 (right) antenodals above Sc; 11 (left) and 13 (right) antenodals below Sc; 18 (left) and 16 (right) postnodals above R1. Quadrangle with 2 crossveins in forewings and 2 or 3 in hind wings. 1A arises distinctly proximal to Ax1. R3 arises between Px 1 and 2. Pterostigma black, covering 4–5 underlying cells.

Abdomen. Dorsoventrally flattened; in dorsal view roughly cigar-shaped, S3–S6 broadest, other segments gradually narrowing towards base and tip (Figure 3). Dorsum predominantly black with conspicuous whitish blue dorsal patches on S 7–9. S7–8 with posterior margins narrowly black, S9 with blue colour restricted to a pair of patches covering the anterior 2/3rd of segment and divided by black along median carina. A very narrow, yellowish brown stripe along the middorsal carina on S2–5. Intersegmental rings between S3–4, S4–5 and S5–6 yellowish brown on dorsum. Abdomen sides black with yellowish brown markings as follows (cf. Figure 1): S1 with small lateral spot; S2 and S3 with rather broad, elongate lateral patches, covering almost



Figure 3. Habitus of the holotype male of *Indocypha cyanicauda* sp. nov., dorsal view.

the whole length of the segment, tapered caudad in S3; S4 lateral patch interrupted; S5 and S6 only with narrow streaks in the anterior part. Ventral border of tergites with narrow brownish yellow stripe on S4–8. Anal appendages black; cerci bending inwards in dorsal view and slightly bent downwards in lateral view. Paraprocts slightly bent inwards in dorsal view; nearly 1/2 of the length of cerci.

Measurements (mm)

Total length 35; abdomen 22; hind wing 26.

Female paratype

The description is based on a specimen collected at the site and date as the holotype. The living specimen in Figure 4 matches well with this paratype.

Head: Pale markings on head more extensive than in male. Base of mandibles with bluish yellow spot. Genae yellow or yellowish brown up to the point midway between level of anterior and lateral ocelli. Other yellowish brown markings include two pairs of lateral spots at posterior surface of rhinarium, two crescent-shaped spots on anterior surface of frons, a pair of small spots between bases of antennae, a pair of small spots beside lateral ocelli and a pair of triangular spots on the side of occiput. In life eyes of similar colour to male.

Thorax. Prothorax black with yellowish brown markings; anterior lobe with a rounded spot; median lobe with a pair of spots on either side; hind lobe with central narrow streak, posterior edge with a short, pale marking laterally. Synthorax black with yellowish brown markings similar to male; a clear narrow stripe along dorsal carina, forming an Y-shaped figure anteriorly. Legs entirely black.



Figure 4. Female individual of *Indocypha cyanicauda* sp. nov., photographed at Luosuojiang River (Yunnan, Xishuangbanna) by Hao-miao Zhang in November 2017.

Wings. Hyaline, with brownish tint at base. Forewings: 14–15 antenodals above Sc; 13–14 antenodals below Sc; 17 postnodals above R1. Hind wings: 12–14 antenodals above Sc; 13–14 antenodals below Sc; 15–17 postnodals above R1. Quadrangle with 2 crossveins in forewings and 2 or 3 in hind wings. 1A arises distinctly proximal to Ax1. Pterostigma black, covering 3–5 underlying cells.

Abdomen. Largely black with yellowish brown markings. Narrow stripes along middorsal carina on S2–S8. S1 with a distinct lateral spot; S2–S8 with a broad, lateral, posteriorly tapering stripe, interrupted by intersegmental rings. Intersegmental rings on dorsum of S2–S7 yellowish brown. S9–S10 and ovipositor black. Cerci about 1.5 times as long as S10.

Measurements (mm)

Total length 31.5; abdomen 19; hind wing 27.

Variation in male paratypes

In younger males the markings on the thorax and sides of the abdomen are yellow, indicating that these darkened with age. On the other hand in younger males the blue patches on the dorsum of abdomen are more intense blue and become paler owing to light pruinescence (epicuticular wax crystals) in older specimens, including the holotype; the difference can be seen in Figures 1 and 2. In younger specimens there is a pair of tiny pale spots between the base of antennae. In some paratype males there are pale markings on the prothorax and the lateral markings on the sides of the synthorax are much broader than in the holotype. In younger specimens the pale brownish tint at the wing base is more extensive. The details of wing venation vary to some extent, but in all specimens 1A arises distinctly proximal to Ax1.

Measurements (mm)

Total length 34–37; abdomen 21.5–23; hind wing 25–26.5.

Variation in female paratypes

Length of the narrow curved stripe on mesepimeron differs, from 2/3rd length (similar to male) to extending throughout the mesepimeron, those with longer stripes usually have it interrupted at the lower 1/3 point. Some females have a small spot on dorsum of S9 posteriorly. Younger females have markings more yellowish. The details of wing venation vary to some extent, but in all specimens 1A arises distinctly proximal to Ax1.

Measurements (mm)

Total length 31–32; abdomen 19–20; hind wing 27–28.

Distribution

China (Xishuangbanna in southern Yunnan) and northern Vietnam.

Differential diagnosis

The male of *Indocypha cyanicauda* sp. nov. is easy to separate from its congeners by the colour pattern of the abdomen, S7–8 and part of S9 being cerulean to pale cerulean blue. Of the other species in the genus, only *I. vittata* has bluish marking on the abdomen, males of the other known species having an abdomen predominantly reddish brown, orange or black with conspicuous reddish orange segments in the apical part; see Zhang et al. (2010) and Hämäläinen (2014).

In the *vittata* male the middle part of abdomen is pale blue. In specimens from Kanchanaburi (Thailand) S3–6 are distinctly pale blue; see fig. 8 in Hämäläinen (2014). In Yunnan individuals S3–7 range from pale blue with a greenish tinge to a distinct yellowish green (Figure 5). It is not certain if the green tint is associated with younger individuals but this seems likely. The male of *vittata* is larger than *cyanicauda*, its total length being typically 37–38 mm. In *vittata* the shape of the abdomen is also slightly different in dorsal view, tapering more distinctly towards the apex.

Females of *I. cyanicauda* (Figure 4) and *I. vittata* (Figure 6) can be separated by details of the colour pattern of the synthorax and abdomen. In *vittata* there are two rows of pale lateral stripes on the abdomen (see also fig. 11 in Hämäläinen 2014), in *cyanicauda* the ventrolateral row of stripes is missing. In *vittata* the pale middorsal markings on abdomen are much broader than in *cyanicauda*, being arrow shaped on S2–4. On the synthorax of *vittata* the pale antehumeral stripe is connected anteriorly with the stripe running along the humeral suture, whereas in *cyanicauda* these stripes are not connected anteriorly.

Notes on ecology and behaviour

Indocypha cyanicauda inhabits rivers and large streams. Luosuojiang River is open, deep and wide, the section of the type locality is about 50 m width, even at the bank it is over 0.5 m deep with a substrate of mud. The river is turbid throughout the year. Most specimens were collected at the muddy river bank, where the males perch on the branches of dense short trees above the water defending small territories. Intruders are typically chased off, but often the newcomer engages the occupant in a territorial contest. The male courts the perched female by displaying its legs,



Figures 5, 6. *Indocypha vittata* male (5) and female (6), photographed at Luosuojiang River (Yunnan, Xishuangbanna) by Hao-miao Zhang in May 2016.

and the sky blue abdomen tip, which is deflexed sharply downwards. During courtship the male first presents his abdomen tip laterally, rocking from side to side, and as courtship progresses he faces or flies above the female, lowering and presenting his white tibia in the manner found in many chlorocyphids (Figures 7–9). At times other males disrupt courtship. They are very strong flyers – both sexes can move very rapidly and often hover for several seconds. Females lay eggs



Figures 7–9. Reproductive behaviour of *Indocypha cyanicauda* sp. nov. (7) Male guarding mated female; (8) male displaying abdomen tip to female (not visible) during courtship; (9) courtship with legs displayed interrupted by another male (above), female signalling rejection. Photos taken at Luosuojiang River (Yunnan, Xishuangbanna) by Hao-miao Zhang in November 2017.

into dead wood on the ground or in mud, guarded by the male perched nearby. In late November, males appeared in the river bank after 12:00 and were most abundant between 13:00 and 15:00. Females were commonly seen from 13:30 to 14:30. Only occasional females were seen at other streams in October 2012 and November 2017, respectively.

I. cyanicauda is a late season species. Immature individuals have been recorded from the beginning of October, and some aged individuals were found at the beginning of December, hence its flight season extends from at least early October to December. Also its congener *I. vittata* inhabits the Luosuojiang River, but this species flies from April to July. The river is also home to the calopterygoid species *Heliocypha perforata* (Percheron, 1835), *Neurobasis chinensis* (Linnaeus, 1758), *Dysphaea gloriosa* Fraser, 1938 and *Euphaea masoni* Selys, 1879. Other odonate species present include *Macromia* spp., *Nychogomphus* spp., *Anisogomphus* spp., *Burmagomphus* spp., *Trithemis* spp., *Onychothemis testacea* Laidlaw, 1902 and *Zygonyx iris insignis* (Kirby, 1900). It is possible that *Indocypha silbergliedi* also occurs on the same river, given that one male of this early season species was collected on a nearby road (by Adolfo Cordero-Rivera on 29 June 2016) and one male at Xishuangbanna Tropical Botanical Garden (by Chao Wu on 28 April 2012).

Remarks on the old *Indocypha* specimens in coll. René Martin

Hämäläinen (2014) described a new species *Indocypha neglecta*, based on a series of specimens well over 100 years old from “Tonkin” in the former collection of René Martin, presently at the Muséum national d’Histoire naturelle, Paris (MNHN). The dorsum of the male abdomen in *I. neglecta* is predominantly black with S7–8 strikingly reddish orange. One of the male specimens (with rather faded colours) in this series differed to some extent in the colour pattern of the abdomen and synthorax (for details, see Hämäläinen 2014, p. 84–85), and it was therefore excluded from the type series of *neglecta*. Re-examination of this specimen from “Tonkin” carried out by the second author (MH) shows that it is in fact *Indocypha cyanicauda*. Also the teneral female specimen listed in the same paper (p. 89) as “*Indocypha* sp.” belongs to *cyanicauda*. This specimen has a handwritten label, confusingly with the word “Cambodge” on the front side and “*Calicnemia atkinsoni*. Tonkin” in the reverse side. On the basis of this new evidence it is probable that there was a confusion of labels and that this female specimen and the male from “Tonkin” came from the same location somewhere in northern Vietnam. One male specimen of *neglecta* in Martin’s material has detailed collecting data on the attached labels: “Tonkin, Montagnes du Haut Song-Chai, September 1895”, and this specimen was selected as the holotype. These mountains are located in Ha Giang province in northern Vietnam, close to the Yunnan border. It is possible that some of the other *neglecta* specimens, as well as both *cyanicauda* specimens, were also collected in these mountains. Of course, without further evidence this must remain speculative. However, given the late flight season of *cyanicauda* (see above), the collecting date in September would fit with the teneral specimens of *cyanicauda*. It is also possible that *neglecta* and *cyanicauda* occur at the same sites, both being late season species. So far, *neglecta* has not been found in China, but it is expected to occur in southern Yunnan.

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